Pilot program in North Pacific announced

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A pilot program for investigation of the vast central North Pacific designed to obtain knowledge of ocean-atmosphere interaction and to improve long-range oceanographic and meteorological forecasting was announced today by the University of California, San Diego's Scripps Institution of Oceanography and the Office of Naval Research.

"A four-million-square-mile region extending some 1,000 miles south of the Aleutian Islands comprises the area in which we will initiate observations and study of physical changes in the upper ocean layers," Dr. William A. Nierenberg, director of Scripps Institution, said. "If the results of the pilot study warrant, we will plan to carry out a long-range study.

"Included among the beneficiaries of a long-range study will be Navy vessels and aircraft, U.S. Weather Bureau forecasters, the U.S. Bureau of Commercial Fisheries, commercial fishermen, farmers, ship operators, and UNESCO's World Weather Watch, which is expected to become operational in the early 1970's," he explained.

Principal investigator for the study is John D. Isaacs, professor of oceanography at Scripps, and director of Scripps' Marine Life Research Group.

For this initial study, Scripps scientists and engineers, who have had deep-moored instrument stations under development since 1952, will install two clusters of four, deep-moored, unmanned, catamaran-type, floating instrument stations north and northwest of Hawaii. In the center of each cluster will be a 40-foot Monster buoy, developed for the Office of Naval Research by the Convair Division of General Dynamics, which has already been tested extensively off the Florida coast and Bermuda.

The Scripps-developed instrumented stations, moored in water 12,000 to 18,000 feet deep, will record surface wind speeds and directions and water temperatures at depths extending to 1,000 or 1,500 feet below the surface. A separate station in each cluster will measure ocean currents. The moored stations will also record barometric pressures, solar radiation, and relative humidity.

The two Convair-developed stations will record water temperature, surface wind, speed, and direction; barometric pressure, precipitation, relative humidity, solar radiation, and wave height. They will telemeter data for immediate use by the scientists in various governmental groups. The Convair-ONR Monster buoy Alpha, anchored off La Jolla, Calif., in early June by Scripps and Convair engineers, is presently undergoing long-range telemetry tests.

Among organizations with which Scripps and the Office of Naval Research are cooperating in the study are the Weather Bureau, the Bureau of Commercial Fisheries, the Navy's Fleet Numerical Weather Facility, Monterey, Calif., the U.S. Coast Guard, the National Aeronautics and Space Administration, and other universities.

Isaacs said that one of the critical problems of oceanography is to determine the nature and causes of the large-scale persistent shifts in the temperature of the surface water of the oceans.

"We have long been aware of historical and continuing fluctuations in conditions along most coasts, but it has been only in the last ten years that we have realized that these local changes are only a part of very extensive changes involving entire oceanic regions," he explained.

"The immense scale of these changes was revealed by the Bureau of Commercial Fisheries in studies of sea surface temperatures from ship reports.

"The existence of these changes is readily apparent from vessel measurements, but the nature of the processes involved cannot be documented by any feasible ship survey, so we are turning to an array of these successfully tested, deep-moored platforms bearing continuous recording instruments at a number of depths to give us the data we need."

Richard A. Schwartzlose, associate oceanographic specialist at Scripps, cautioned against expecting swift results from the forthcoming investigations.

"A pilot study is necessary to determine the direction of the program. This is a program with questions we cannot answer quickly. Changes in the ocean occur much more slowly than in the atmosphere," he said. "In some ways this is advantageous to our study, for the ocean responds to a fairly long term average of the atmospheric conditions, and thus the short term fluctuations in the ocean may be less important than in the air.

"We are now analyzing past ocean data especially for the hints that they yield to the causes of these changes and to guide us in such problems as choosing the location of the instrument clusters."

It is expected that measurements of several portions of the infrared spectrum of the ocean surface will be carried out and color photographs taken by NASA's Manned Orbital Laboratory aircraft during their instrument-calibration flights above the area. In this operation, the NASA-MOL would make their calibrations by means of the instrument stations used in the Scripps study. Pictures of the Pacific Ocean cloud pattern from satellites will be extensively used.

Background Information

Deep-moored instrument stations have been under development by Professor Isaacs at Scripps for some 15 years, most recently by his engineers, George B. Schick and Meredith H. Sessions, of Scripps.

Early deep mooring problems were solved during some of the Pacific Proving Ground operations. The first moorings were put in by Isaacs and Willard Bascom in 1952. Later Scripps engineers maintained as many as 30 stations in water as deep as 18,000 feet for periods of six months in that area. These stations were adapted only to surface and near-surface measurements, however.

Development of a type of station suited to deeper measurements involved new problems and these have been slowly solved.

For the past two or three years, data obtained from the latter type of deep-moored instrument stations have been fruitful; several thousand hours of continuous records have been obtained from various stations moored in the open sea between California and Hawaii. Two stations have been in operation in the deep water of the equatorial Pacific since February.

Isaacs pointed out that profound shifts in ocean conditions occur many places in the world's oceans, and are associated with climatic changes.

"These changes often have greatly affected the lives of many people," he said.

"Fisheries have appeared and disappeared; hurricanes have visited coasts during some periods and shunned them in others; great quasi-cyclic alternations of rainfall and drought have successively stimulated and destroyed agriculture.

"An example of such a change occurred from the middle of 1957 through about 1960, when water temperatures were much higher than the long-term mean over much of the eastern North Pacific. Tropical and subtropical fish migrated even to southern Alaska as a result.

"The various oceanographic investigations carried out during the period documented this large-scale oceanic event, but they were inadequate for us to understand the causes of this phenomenon.

"Perhaps the most celebrated of such phenomena is the El Nino of the Peruvian coast. Here, masses of warm water periodically flow over the cold coastal current with considerable changes in the fisheries and disastrous results to the birds and sometimes even to the local inhabitants.

"Data are so scanty in this region that even the source of this warm water cannot be specified and some evidence suggests that it comes from the west, other from the north."

Isaacs said that important but less dramatic meteorological and oceanographic changes influence every region of the world, that they can often be directly ascribed to changes in ocean conditions, and that in every case, oceanic changes are undoubtedly involved.

He said it was his belief that these changes have a compound origin "related to changes in the distribution of atmospheric pressure, with resultant changes in surface winds, cloud cover, distribution of surface temperature, and evaporation, and interactions between all of these. The nature of these shifts is poorly understood."

The North Pacific pilot study will also include a sampling of plankton because, as Isaacs pointed out, "this constitutes an important and exciting link with the recent past history of the ocean's boundary currents as recorded by varved layers of sediments in the coastal basins. In addition, the biological evidence can answer important questions directly.

"For example, the strong warming of the California coast in 1958 could have involved a flow of Central Pacific water, or, alternatively, a flow of subtropical coastal water as a countercurrent. The absence of Central Pacific assemblies of marine species and the abundance of subtropical coastal species off California provided a clear answer that is was the latter.

"It will be a great challenge to make the best use of the many lines of evidence from the different sciences in gaining understanding of these important processes."